REMARKS

The specification and the claims have been amended to better define element 46 as a post rather than a hub, as a review of the drawings clearly illustrates that the structure is more appropriately defined by that term, and as further supported by references within the specification that the needle piercing tip is embedded therein. The claims now positively recite the feature, along with language defining the pre-use and post0use configurations of the device.

It is respectfully submitted that the claims as now presented are patentable over the cited prior art, on the basis of the above remarks, and reconsideration and subsequent passage for allowance is hereby requested.

Respectfully submitted,

Thomas C. Saitta, Reg. No. 32102
Attorney for Applicant

Rogers Towers, P.A.
1301 Riverplace Blvd.
Suite 1500
Jacksonville, FL 32207
904-346-5518
904-396-0663 (fax)

AN 2001:152280 CAPLUS
DN 134:196690
TI Cadmium-free silver-copper brazing alloys
IN Kempf, Bernd; Wittpahl, Sandra; Kaufmann, Dieter
PA Degussa-Huls Aktiengesellschaft, Germany; Brazetec GmbH
SO Eur. Pat. Appl., 8 pp.
CODEN: EPXXDW
DT Patent
LA German
FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	EP 1078711	A1	20010228	EP 2000-117138	20000810
	EP 1078711	B1	20050629		
	R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO				
	DE 19940115	A1	20010301	DE 1999-19940115	19990824
	AT 298649	E	20050715	AT 2000-117138	20000810
	ES 2242562	T3	20051116	ES 2000-117138	20000810
	NZ 506379	A	20011221	NZ 2000-506379	20000816
	TW 528637	B	20030421	TW 2000-89116709	20000818
	JP 2001087889	A2	20010403	JP 2000-251145	20000822
	ZA 2000004336	A	20010227	ZA 2000-4336	20000823
PRAI	DE 1999-19940115	A	19990824		

AB The Cd-free brazing alloys contain Ag 45-75, Cu 10-30, Ga ≤20, Zn 1-25, Sn and/or In ≤6, Mn 0.1-8 or Si and/or Ge 0.1-3%. The nontoxic alloys have a low melting temperature and high wettability. The alloys are suitable for brazing of hard metals such as brazing of diamond-coated hard metal components in manufacture of drill bits.

RE.CNT 9 THERE ARE 9 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

FULL CONTENTS

[Claim(s)]

[Claim 1] In the brazing solder alloy of cadmium non-**, to 45 to Ag75 mass %, ten to Cu30 mass %, and Ga20 mass % The brazing solder alloy of cadmium non-** characterized by containing other alloy elements to 5 mass % in total by 0.1 to Mn8 mass % or Si, and/or 0.1 to germanium3 mass %, and a case to one to Zn25 mass %, Sn, and/or In6 mass %.

[Claim 2] The brazing solder alloy according to claim 1 which contains Co or nickel to 5 mass % in other alloy elements.

[Claim 3] The following presentations: Ag 50 to 70 mass %, Cu Ten to 20 mass %, Ga One to 20 mass %, Zn Five to 20 mass %, Sn, and/or In Zero to 6 mass %, Mn 0.1 to 8 mass % or Si, and/or germanium Brazing solder alloy according to claim 1 or 2 characterized by 0.1 - 3 mass %.

[Claim 4] The following presentations: Ag 50 to 60 mass %, Cu Ten to 20 mass %, Ga One to 20 mass %, Zn Ten to 20 mass %, Sn, and/or In One to 6 mass %, Mn Brazing solder alloy given [from Claim 1 to 3] in any 1 term characterized by 0.1 - 8 mass %.

[Claim 5] The following presentations: Ag 60 to 70 mass %, Cu Ten to 20 mass %, Ga Ten to 20 mass %, Zn Five to 10 mass %, Mn 0.1 to 8 mass % or Si, and/or germanium Brazing solder alloy given [from Claim 1 to 3] in any 1 term characterized by 0.1 - 3 mass %.

[Claim 6] The activity of a brazing solder alloy with high silver content given [from Claim 1 for soldering of a hard metal to 5] in any 1 term.

[Claim 7] The activity according to claim 6 for soldering of a hard metal segment which gave the diamond for manufacturing a boring head, or carried out the diamond coat.

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the brazing solder alloy of a low-melt point point by cadmium non-** which has good wetting power on a hard metal.

[0002]

[Description of the Prior Art] Especially soldering is an economical conjugation method which protects an ingredient, and has high technical importance also in a mass production method also in the case of junction of each components. The big advantage of soldering is that an ingredient is mutually joinable at a comparatively low temperature with pewter. A soldering defect decreases in the effect of junction on energy expenditure and a base material, and general, so that soldering temperature is low. Therefore, especially the brazing solder of a low-melt point point has much need.

[0003] Pewter of a usual silver base contains other elements by Cu, Zn, Sn and In, and a case as a main alloy element in addition to Ag. Cadmium inclusion silver solder is a low-melt point point, and it is easy to solder, and it is various, and can apply it. however, cadmium -- and especially the steam has carcinogenicity. Therefore, the aforementioned pewter is [that the activity is only allowed and], protecting strict safety precaution. The advantage of pewter of cadmium inclusion is an especially low soldering temperature in which especially the low fusing point range ****** is possible. This was not attained from pewter of Ag base of usual cadmium non-** till these days.

[0004] However, the brazing solder of Ag which attains a soldering temperature having no addition of cadmium and lower than 630 degrees C over the past several years is well-known. this is attained when the aforementioned wax alloy contains Element Ga substantially by the ratio adjusted to versatility to other alloy elements.

[0005] Such an alloy is indicated to the patent specification DE No. 4315190, DE No. 4315189, DE No. 4315190, and DE No. 4323227. Especially the aforementioned alloy is devised as a substitute for the pewter of cadmium inclusion fused at low temperature.

[0006] In order to maintain as small as possible the cooling stress which is started thermally [since the coefficients of thermal expansion of a hard metal and a support material differ] especially in soldering of a hard metal, it asks for a low soldering temperature. That is, in addition to the difference of an expansion coefficient, the temperature gradient between the curing temperature of pewter and a room temperature is decisive for the magnitude of the stress induced. The hard metal [in / especially / tool industry] which offers high frictional resistance especially for the activity in a boring head and which carried out the diamond coat is used. Since it does not damage a diamond layer when to solder in the air the aforementioned hard metal which carried out the diamond coat on a support material under the activity of flux is needed from the Reason for technical, the soldering temperature must not exceed about 690 degrees C. Process safety and the safety of the quality of a product are so high in this case that soldering temperature is low.

[0007] However, since pewter in particular of well-known gallium inclusion does not wet the hard metal with which a hard metal and it are also used as a boring head good from the aforementioned literature, a soldering process becomes difficult by this.

[0008]
[Problem(s) to be Solved by the Invention] Therefore, the technical problem of this invention is offering the brazing solder which has the wettability of a toxic component, for example, a hard metal further very good [not containing cadmium in particular but], and has a soldering temperature lower than 650 degrees C. This especially pewter should be still more suitable because of soldering of a hard metal which carried out the diamond coat.
[0009]
[Means for Solving the Problem] By this invention, said technical problem to 45 to Ag75 mass %, ten to Cu30 mass %, and Ga20 mass % It is solved with the brazing solder alloy of cadmium non-** characterized by containing other alloy elements to 5 mass % in total by 0.1 to Mn8 mass % and/or Si, or 0.1 to germanium3 mass %, and a case to one to Zn25 mass %, Sn, and/or In6 mass %.
[0010] The brazing solder alloy of cadmium non-** by this invention may contain Co or nickel to 5 mass % advantageously in other alloy elements.
[0011] The following presentations: Ag 50 to 70 mass %, Cu Ten to 20 mass %, Ga One to 20 mass %, Zn Five to 20 mass %, Sn, and/or In Zero to 6 mass %, Mn 0.1 to 8 mass % or Si, and/or germanium It became clear that the alloy of 0.1 - 3 mass % was very good.
[0012] The following presentations: Ag 50 to 60 mass %, Cu Ten to 20 mass %, Ga One to 10 mass %, Zn Ten to 20 mass %, Sn, and/or In One to 6 mass %, Mn 0.1 to 8 mass %, and Ag 60 to 70 mass %, Cu Ten to 20 mass %, Ga Ten to 20 mass %, Zn Five to 10 mass %, Mn 0.1 to 8 mass % or Si, and/or germanium Especially the alloy of 0.1 - 3 mass % is advantageous.
[0013] The brazing solder alloy of cadmium non-** by this invention can be used especially advantageous because of hard soldering of a hard metal. The brazing solder by this invention has working temperature clearly lower than usual brazing solder.
[0014] Especially working temperature is the working temperature of brazing solder with cadmium inclusion of a low-melt point point, as a result a problem, and the working temperature of the brazing solder of the gallium inclusion by cadmium non-**, or is mainly a temperature lower than this.
[0015] In the 1st table furthermore indicated below, the comparisons with some alloys of the alloy (No.1-7) by this invention and the presentation (a presentation is mass %) of the brazing solder (No.8 and 9) of the gallium inclusion by well-known cadmium non-** and such working temperature are indicated.
[0016] Casting is possible very good, and pewter according to this invention based on comparatively few rates of Mn as an alloy content can change, as a result processing and treatment are satisfactorily possible for it in a manufacture process.
[0017] Especially the unexpected and unexpected characteristics of the brazing solder by this invention are the advantageous humid behavior on a hard metal.
[0018]
[Example] To an assessment of the wetting power of pewter on a hard metal sake The circular pewter plate of regular thickness (0.2mm) and magnitude (5mm in diameter) pierced from various wax alloys was placed on the hard metal test specimen, and flux was applied, and this test specimen was made

into soldering temperature with the heating rate general to application among oven in the air. The surface of the hard metal soaked in pewter is measured after cooling, and it is made to be proportional to the start surface area of a pewter plate. the result -- the 1st table -- "-- it gets wet and writes in the column of index:" It became clear at that time that pewter by this invention had good wettability more remarkable than the brazing solder of gallium inclusion by well-known cadmium non-** on a hard metal to the unexpected thing.

[0019] The advantage relevant to another practice of the brazing solder by this invention is improvement in the shearing strength of the brazing-and-soldering part manufactured using this brazing solder.

[0020] Especially the brazing solder alloy of cadmium non-** according to this invention based on the aforementioned characteristics profile is remarkably suitable in the case of soldering of a hard metal segment which gave the diamond for soldering of a hard metal (for example, when especially a boring head is manufactured), or carried out the diamond coat.

[0021]

[Table 1]

第1表

No.	Ag	Cu	Ga	Zn	Sn/In	Mn/ Si/Ge	作業温度 °C	濡れ指数 (1)
1	56	18.5	3	17	5(Sn)	0.5 (Mn)	620	3
2	56	16	3	17	3 Sn 2 In	3(Mn)	610	5
3	56	14	3	17	5(Sn)	5(Mn)	635	7
4	62	15	15	7	-	1(Si)	600	4
5	62	13	15	7	-	1 Si 2 Ge	580	5
6	62	11	15	7	-	5(Mn)	615	6
7	54	20	3	17	5(Sn)	1(Ge)	610	3.5
8	55	20	3	17	5(Sn)	-	630	1.5
9	63	15	15	7	-	-	600	2

(1) 濡れ指数：= 出発表面積／ろう付けされた面積の比

[Translation done.]

AN 1994:593371 CAPLUS
DN 121:193371
TI Internal-oxidized silver-tin-indium (Ag-Sn-In) alloy electric contact material
IN Tanaka, Yasukazu; Iida, Shoji; Tanaka, Yasufumi
PA Chugai Electric Ind Co Ltd, Japan
SO Jpn. Kokai Tokkyo Koho, 3 pp.
CODEN: JKXXAF
DT Patent
LA Japanese
FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	JP 06136472	A2	19940517	JP 1992-324578	19921021
	JP 3245690	B2	20020115		
PRAI	JP 1992-324578		19921021		

AB The elec. contact material is obtained by internal oxidizing a Ag alloy containing Sn 3-15, In 0.1-7, Tl 0.1-7, and optionally Fe, Co, and/or Ni 0.001-1 weight%. The material showed stable contact resistance.

FULL CONTENTS

[Claim(s)]
[Claim 1] The internal oxidation electrical contact material of the Ag-Sn-In system alloy which carried out internal oxidation of the alloy of Remainder Ag to 3 to 15weight % of Sn, 0.1 to 7weight % of In, and 0.1 to 7weight % of Tl.
[Claim 2] The internal oxidation electrical contact material of the Ag-Sn-In system alloy which carried out internal oxidation of the alloy of Remainder Ag for 1 or the plurality of Fe of 3 to 15weight % of Sn, 0.1 to 7weight % of In, 0.1 to 7weight % of Tl, and Fe group element metal, Co, and nickel to 0.001 to 1 weight %.

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the charge of electrical-contacts lumber which can be widely used for electrical equipments, such as a switch, and a breaker, a connector, especially an Ag-Sn-In system internal oxidation electrical contact material.
[0002]
[Description of the Prior Art] As this kind of an electrical contact material, what carried out internal oxidation of the Ag-Cd alloy was developed first. However, to avoid the activity of Cd for prevention of pollution is desired, and what carried out internal oxidation of the Ag-Sn alloy is used widely recently. It is very difficult to distribute uniformly and to carry out internal oxidation of the Sn in an Ag alloy, for this reason, In is added into an Ag-Sn alloy, and the electrical contact material which carried out internal oxidation of this Ag-Sn-In system alloy is used.

[0003] Even if the electrical contact material which carried out internal oxidation of this Ag-Sn-In system alloy is excellent in many characteristics as electrical contacts and surpasses an Ag-Cd oxide electrical contact material, it is not inferior, but in respect of the stability of contact resistance, amelioration of one step is just going to be expected now.

[0004]

[Problem(s) to be Solved by the Invention] Then, this invention is made in an activity life for the purpose of offering the internal oxidation electrical contact material of the Ag-Sn-In system alloy which has the contact resistance which carried out termination stability.

[0005]

[Means for Solving the Problem] In this invention, 0.1 to 7weight % of Tl (thallium) was added to the Ag alloy containing 3 to 15weight % of Sn, and 0.1 to 7weight % of In, and internal oxidation of this alloy was carried out. Tl did not have the public nuisance nature like Cd, but it was found out that internal oxidation of the Sn can be far carried out in Ag uniformly rather than the case where only In is moreover used.

[0006] That is, when Tl is used with In to the deoxidation ghost layer called "become it dry" on the surface of an alloy being accepted when only In is used, this inconvenience does not arise. Moreover, when Tl was used with In to Ag grain boundary being accepted during an alloy organization when only In is used, most Ag grain boundaries were not accepted but it was accepted that Sn oxide carries out deposit oxidation uniformly over an alloy at large.

[0007] Moreover, since Tl oxide has a fusing point and a vapor point similar to Cd oxide, as for the Ag-Sn oxide electrical contact material having contained Tl oxide, self-consecration of the contact side is carried out like the case of an Ag-Cd oxide contact material. This contributes to stabilization of the contact resistance of a point of contact greatly.

[0008] In order for 3weight % of the lower limit of Sn used for the Ag alloy of this invention to make fire resistance the contact material obtained, it is a complement, and 15weight % of that ceiling value is an amount not to spoil the workability of the contact material obtained extremely.

[0009] In order to support the internal oxidation of Sn, the amount of In is at least 0.1 weight %, and if the amount exceeds 7 weight %, it will make an ingredient weak. Moreover, in order for 0.1weight % of the lower limit of Tl to promote the internal oxidation in the inside of Ag of the above-mentioned Sn, it is the minimum amount for guaranteeing the self-consecration nature of a contact side, and 7weight % of the ceiling value is an amount for leaving workability to the contact material obtained. In addition, there are Sn, above-mentioned In, and above-mentioned Tl of weight % within limits which may dissolve with Ag, respectively.

[0010] Moreover, you may make 1 or the plurality of Fe of Fe group element metal, Co, and nickel contain 0.001 to 1weight % further in an Ag alloy for adjustment of the crystalline structure of an alloy as carried out conventionally.

[0011]

[Example]

(1) 10 weight % of 2 weight % of - with a 0.2 weight % of 2 weight % of 3 weight % of.- with a 1

weight % of 3 weight % of - with an Ag-Sn of 6 weight % In(s)-Tl(2) Ag-Sn of 6 weight % In(s)-Tl-nickel(3) Ag-Sn of 6 weight % In(s)(4) Ag-Cd [0012] The alloy (3) for the alloy (1) of above-mentioned this invention, (2), and comparison and a formed part of (4) were dissolved with the high frequency fusion furnace, respectively, and it was made the ingot. After carrying out the machine cut and carrying out peeling of the surface of this ingot, the pure Ag plate was stuck to this field by which peeling was carried out by pressure with hot press. This was annealed at about 600 degrees C for 30% of every rolling rate, and it rolled in tabular [of 2mm]. Internal oxidation of this plate was carried out in 700 degrees C and the oxygen environment of 7atm.

[0013] This plate was pierced to the punch of the diameter of 6mm, and the contact sample (1) respectively corresponding to the above-mentioned alloy (1) with an outside diameter [of 6mm] x thickness of 2mm, (2), (3), and (4), (2), (3), and (4) were obtained.

[0014] In order to measure each contact resistance (momega), these samples were attached to the magnet switch and tested on condition of following based on JIS-AC3. In addition, measured value measures and obtains the power-source side and load ******** in momega meter.

** Pressure: AC 200V (charge) 35V (cutoff)

** Style: 150A (charge) 25A (cutoff)

load reactor: -- pf=0.35 ** degree: -- a part for 60 times/-- time number: -- 2,000,000 times contact-pressure: -- 100g of the result was as in Table 1.

[0015]

[Table 1]

下記回数終了時の接触抵抗（mΩ）

	初期	20万回	40万回	60万回	80万回	100万回	120万回	140万回	160万回	180万回	200万回
試料(1)	23	25	27	25	29	25	25	28	26	30	28
試料(2)	23	26	27	25	29	25	25	28	26	30	28
試料(3)	30	60	55	40	60	52	54	30	60	35	50
試料(4)	10	20	18	溶着	—	—	—	—	—	—	—

[0016]

[Effect of the Invention] As for a passage clear from the above-mentioned test result, even if it compares with an excellent ordinary contact material the contact material which becomes this invention, the prominent effect that contact resistance is extremely stable is accepted.

[Translation done.]